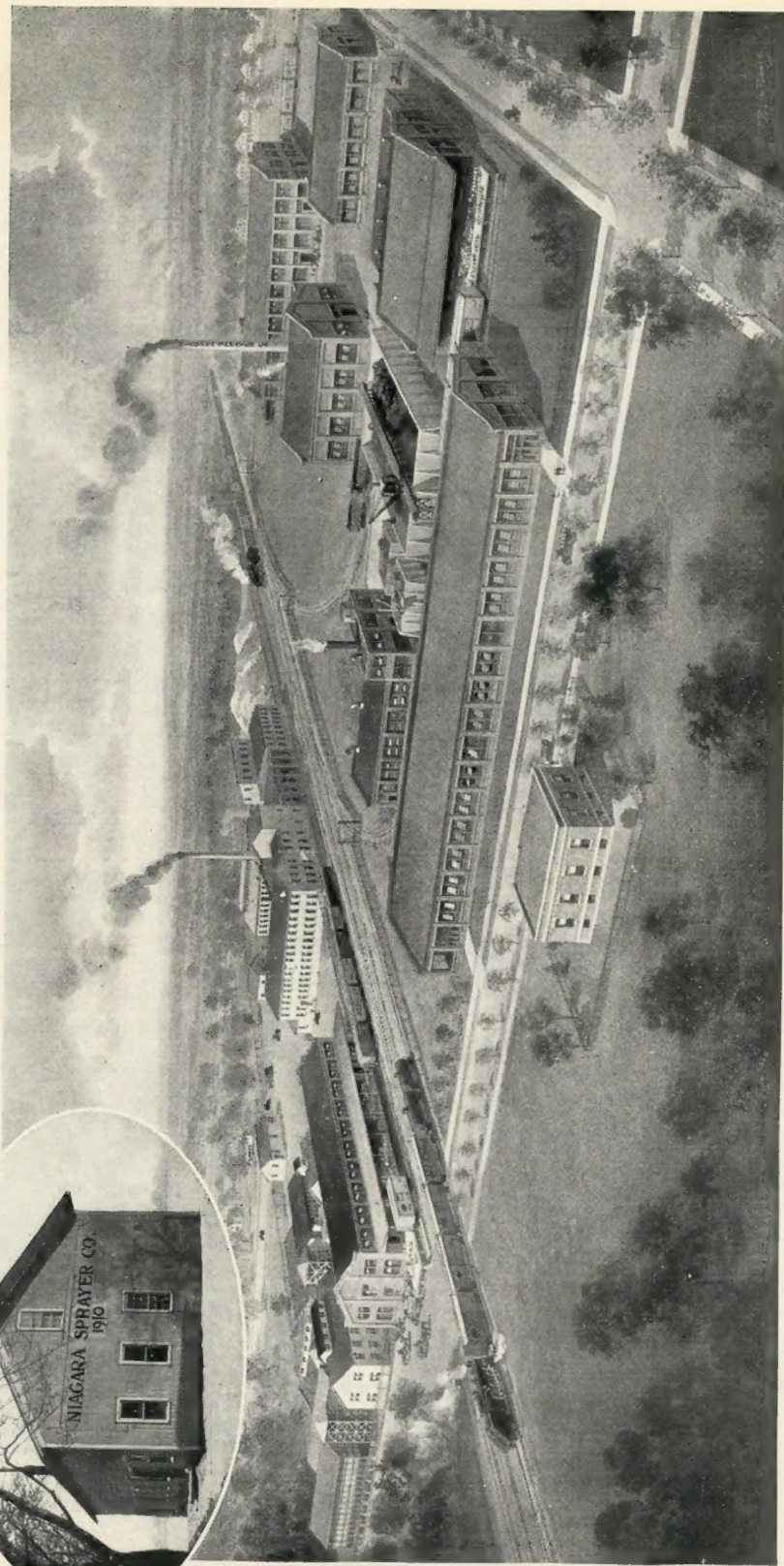


Dusting



NIAGARA SPRAYER CO.
MIDDLEPORT, N.Y.



Plant of Niagara Sprayer Co., Middleport, N. Y.

NIAGARA DUSTING MACHINES *and* MATERIALS



NIAGARA SPRAYER CO.
MIDDLEPORT, N. Y.
Manufacturers of
EVERYTHING for DUSTING PURPOSES

NEW YORK EXPERIMENT STATION
CORNELL UNIVERSITY
ITHACA, N. Y.

BULLETIN 369

“It now seems settled that a mixture of an insecticide and fungicide can be applied in powdered form, using air as a carrier with better commercial results in the control of preventable apple disease, and of apple insects than can be obtained by spraying. At the same time, the dust method makes it possible for the owner of a large acreage to protect his orchard at critical times, a thing that he has not been able to do with the slow liquid process.”

HISTORY OF DUSTING

The method of applying insecticides and fungicides by use of air as a carrier instead of water, is by no means new but has only recently come into large commercial use.

For a considerable length of time the grape growers of France, Spain and Italy have been utilizing the dusting method for the protection of their vineyards against insects and diseases. The method of application and the materials used, of course, have been very crude and, therefore, not entirely efficient. In the Southern part of our own country dusting has been utilized for a considerable length of time as a means of applying poisons and other materials to cotton, tobacco, etc.

Orchard dusting has also been in limited use, and has been the subject of a considerable amount of experimental work during a period of at least twenty years. The orchard dusting machinery up until very recently has been entirely inadequate for the purposes, and the materials used were not fine enough to give the best results. A number of years ago considerable enthusiasm was manifested over experiments being conducted with powdered Bordeaux mixture, which at that time was in general use for orchards. On account of the inadequacy of the machinery for making the applications and the crudeness of the materials used, these very promising experiments did not materialize.

The first successful work with the modern method of dusting in which a machine capable of making thorough distribution of the material was used, and in which for the first time 200-mesh powdered sulphur was used as a fungicide, was conducted by the Cornell Experiment Station in the hop-yards of New York for the control of hop mildew. The remarkable success of these experiments led to further trial of the materials and method for orchard work and at the successful conclusion of a five years' experiment conducted by the New York Experiment Station, orchard dusting came into large commercial use.

The tremendous advantages of applying the material by the dusting method, and its success in controlling the insect pests and diseases has led to its adoption by the largest and most successful growers in nearly every state; especially so in New York State where dusting has been given considerable prominence. To bring the dusting method up to its present status, only one step farther was necessary. This step was taken by the **Niagara Sprayer Company** when it placed its reputation and manufacturing facilities behind the dusting proposition and produced an improved type of orchard dusting machine, and improved materials, including sulphur, arsenate of lead, tobacco and other products for use in the machines.

ADVANTAGES OF DUSTING

The Niagara Duster has no trouble in operating 40 acres a day under average conditions.

Orchards which formerly took three men and a team two days to spray can be given the same protection against most insects and diseases with two men and a team in three hours time. This saving in labor and rapidity in operation is of vital importance to the fruit grower in the busy spring time when so much other important work must be neglected for spraying, and when the effectiveness of the fungicide depends upon applying it at critical times.

In the dusting operation there is no water to haul, there is no time wasted in filling or in going to and from the water supply as enough materials for one-half day's work may be carried on the wagon or left conveniently at the end of the rows in the orchard.

Dusting also eliminates the trouble which many fruit growers experience in trying to obtain water from wells or streams which have dried up during the season.

The total weight of the dusting machine complete with engine is less than 1000 pounds; therefore, wet seasons, soggy ground or rough surfaces interfere in no way with dusting operations, and many times it is possible to use the dusting machines in places where working with the heavy, cumbersome spray rig would be impossible.

The mechanism of the dusting machine is very simple and the wearing parts are very few as compared with the average spraying machine. Therefore, there are no delays from break-downs or adjustments when it is most important that the outfit should be in operation. Simplicity means reliability. Few wearing parts means long life and little depreciation.

By the dusting method a dense cloud may easily be thrown over the highest fruit trees, or it may be used with equal efficiency for bush fruits, potatoes, or other low-growing plants, oftentimes obtaining perfect distribution in places where it is impossible to spray.

It is now generally understood that scab infections occur at special well defined times, usually preceding prolonged wet periods. With the aid of the Federal Weather Bureau it is possible to forecast these infection periods to a considerable extent, and combining with this the rapidity with which the dusting operation can be made, it makes possible the protection of large acreages against this disease at critical times; a problem, which as a general proposition, it is impossible to solve with liquid spraying.

Unlike spraying, dusting is a pleasant and interesting operation and it is not necessary for the operator to in any way come in excessive contact with the materials he is using.



Dusting in a Western New York Apple Orchard

The labor problem is now becoming more acute than ever on the farm and in almost all localities it is impossible to secure competent labor for spraying at times when this work is most pressing. By the dusting operation large acreages may be covered in a single day. This fact largely eliminates the labor problem.

Considering all of the expenses which finally enter into the cost of producing a crop of fruit, it has been demonstrated conclusively that the dusting method averages an actual saving of 25% over liquid spraying. In addition to this, the initial outlay, upkeep and maintenance expended for dusting machinery is considerably less than for spraying machinery.

Dusting materials are practically insoluble, and therefore there is no danger from foliage injury or burning, and as this feature has been a most unsatisfactory one to many who have sprayed for years, the elimination of this trouble will be heartily welcomed.

Besides the many advantages mentioned, dusting has numberless other features which are of vital importance to every man who is attempting to make a profit from growing fruit. Many different individual problems which have only been semi-successfully worked out by liquid spraying may now be solved by the use of the dusting method.

WHAT A DUSTING MACHINE MUST BE

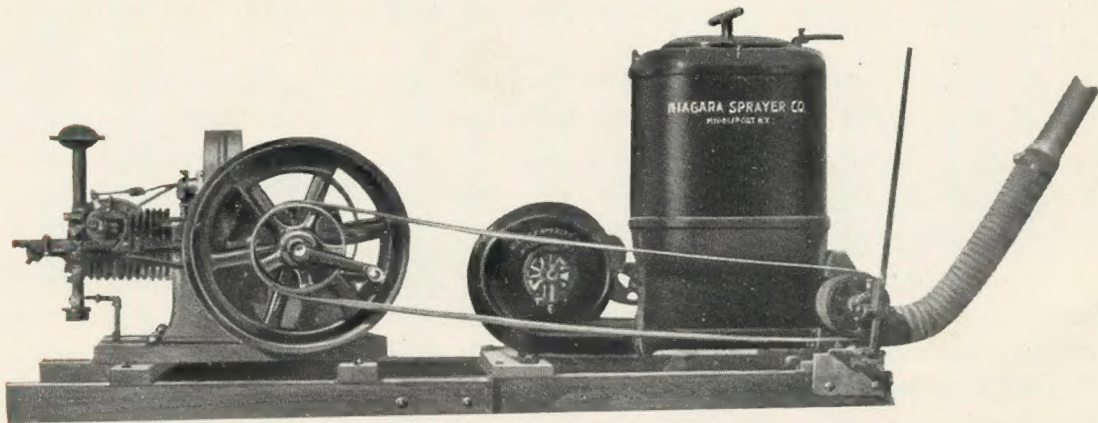
Those who are familiar with the dusting method know that a successful machine for applying the dry materials must measure up to certain requirements of mechanical and practical efficiency in order to accomplish the greatest thoroughness with the greatest economy of materials.

The feeding device must be of such construction that there is an even and steady flow of materials. The flow must be susceptible of very fine and accurate regulation by the operator so that neither too much nor too little dust may be applied to the trees.

Adequate provision must be made for breaking up the "balls" or lumps in the material before it is discharged from the machine as all finely ground powders have a tendency to "ball" into tiny lumps, especially when damp.

The fan which must run at high speed must be of such construction to stand the wear and tear of constant usage, and at the same time return the greatest efficiency from the minimum of power and with as little attention to lubrication as possible. The machine must combine extreme lightness with strong, simple and mechanically perfect construction.

Niagara dusters embody all of these requirements.



Niagara Model W with 2¼ H. P. engine on skids

GUARANTEE

In the manufacture of these machines there has been no expense spared. We believe them to be the best machines that money and skill can produce. We guarantee them for one year against defective material and workmanship, including the necessary wear and tear.

NIAGARA DUSTERS

(Patented in United States and Foreign Countries)

The Niagara Dusters are designed and built especially for dusting purposes by men who are entirely familiar with the requirements of a successful machine for this purpose. The raw materials and the workmanship are of the best and our guarantee is ironclad. Combining as it does complete dusting efficiency with easy accessibility, sturdiness, lightness and simplicity, the Niagara Dusters are by far the best machines on the market for dusting purposes.

“Niagara Dusting Machines gave Perfect Satisfaction”

The Verdict of Hundreds of Users

BRIEF SPECIFICATIONS

SUSPENSION

While the Niagara Dusters have no legs and are set as low as possible on the skid, they are mounted on the three point suspension principle. No strains or twists can disarrange the perfect alignment of any part of the machine, no matter how hard the usage. This three point suspension principle eliminates at once the chief causes of depreciation in ordinary dusting and spraying machinery.

HOPPER

The hopper which carries the dusting material is absolutely dust tight, being composed of only three principle parts; two of cast metal, and one of pressed metal. The capacity is sufficient for at least 100 lbs. of dusting material and the opening at the top is sufficiently large so that a bag of dust may be loaded directly into the hopper without spilling or loss of material. The hopper cover is provided with a rubber gasket seat which makes it dust tight. The cover is removed and held in place by a large two-handled lever at the top, which is very convenient.

THE FAN

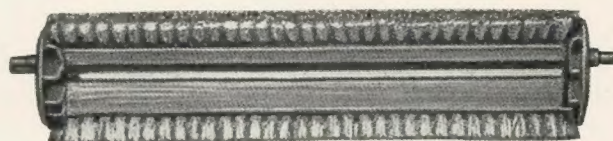
In designing the fan for this machine the best types of American and Foreign blowers have been studied and experimented with. The result is that the Niagara blower is especially adapted for dusting purposes. It is a special aluminum alloy metal which combines lightness with great strength.

The bearings of this high speed fan are of the self oiler type, the same as used on high speed electric motors, and are very large. They are made from the best bearing bronze and are enclosed in a housing which is absolutely dust tight. These bearings do not require frequent attention.

When the machine is in operation the fan rotates at approximately 2500 revolutions per minute thereby producing a forced current of air which is directed through the air chamber at the bottom of the hopper. Here it picks up the dust which is being sifted through the slide feed and carries it out with great velocity through the outlet pipe. At the mouth of the pipe the flow is broken and the dust particles burst into a dense smoke-like cloud, which will cover thoroughly a large apple tree almost instantly.

THE PATENTED FEEDING DEVICE

The feed is accomplished by the use of a revolving cylinder of brushes which forces the material through a perforated plate thereby crushing all lumps before the dust finally falls into the air chamber at the bottom of the hopper. **This feed is not found in any other duster.** Beneath the plate at the bottom of the hopper is a slide feed regulator consisting of two diagonally slotted slides which work over each other. The position of the slides is controlled by a small hand lever conveniently located at the end of the hopper near the discharge pipe. The operator is thus permitted to regulate the amount of material to be discharged. The plate and slides are made of a metal which will resist the corrosive action of sulphur and other chemicals which are used for dusting purposes.



Patented Agitator Brushes

AGITATOR BRUSHES

A cylinder of brushes which accomplish the agitation and forced feed are made of very durable material, but after continually rubbing over the perforated plate at the bottom of the hopper, there is a certain amount of natural wear. This wear may be taken up and the brushes properly adjusted by means of changing the position of the brush holders in their slot. This simple adjustment may easily be made without removing the brushes from the hopper, and with the average use will only be necessary at the beginning of each season.

FEED REGULATING LEVER

At the end and top of the hopper, conveniently located with reference to the operator, is a hand lever for regulating the amount of material to be discharged from the machine. This lever operates over a quadrant and makes possible the regulation of material discharged to a very fine point. A thumb screw stopping device on the quadrant makes it possible to set the feed at any desired quantity.



Expansion band clutch.
Exclusive feature on Niagara power dusters

EXPANSION BAND CLUTCH

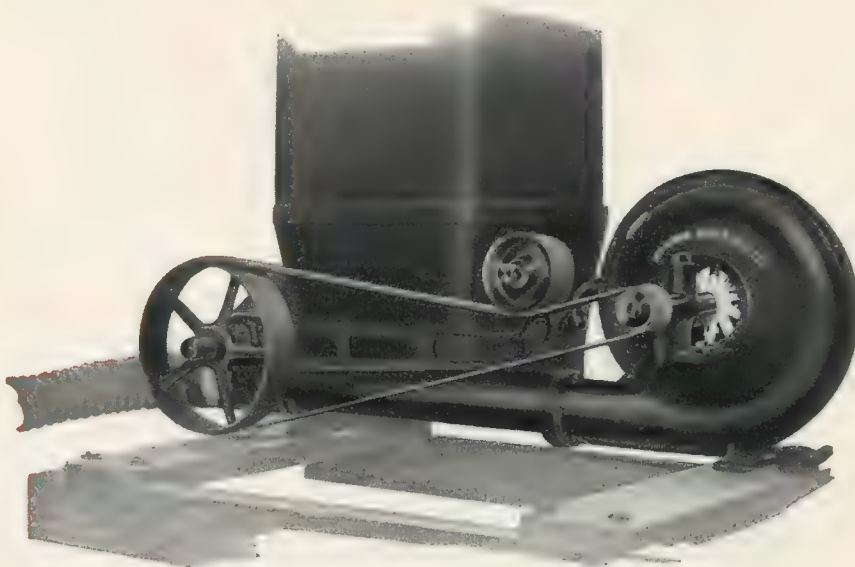
The clutch is located on the countershaft and is convenient to the operator when he is in position for working. This clutch is an exclusive feature found only on Niagara Dusters. It allows the engine to be disengaged when necessary, as in driving from place to place, changing position, refilling the hopper, lubricating, etc., etc.

BELT IDLER

On account of the necessity for continuous and uniform high speed on the fan, it is necessary to provide a Belt Idler or weighted pulley which keeps the belt which drives the fan taut at all times.

BELTS

The regular belting equipment is of the best grade Balata belt which will not only give long and efficient service, but is not affected by dampness or other adverse conditions.



Belt Idler for preventing slippage on fan pulley

WORM GEARS

The agitator brushes are driven by means of a worm gear which is inclosed in a grease-packed housing containing sufficient lubricant for a seasons work without re-filling. The worm is cut directly on the counter-shaft which passes through the gear box, thus giving a very effective and simple mechanical construction.

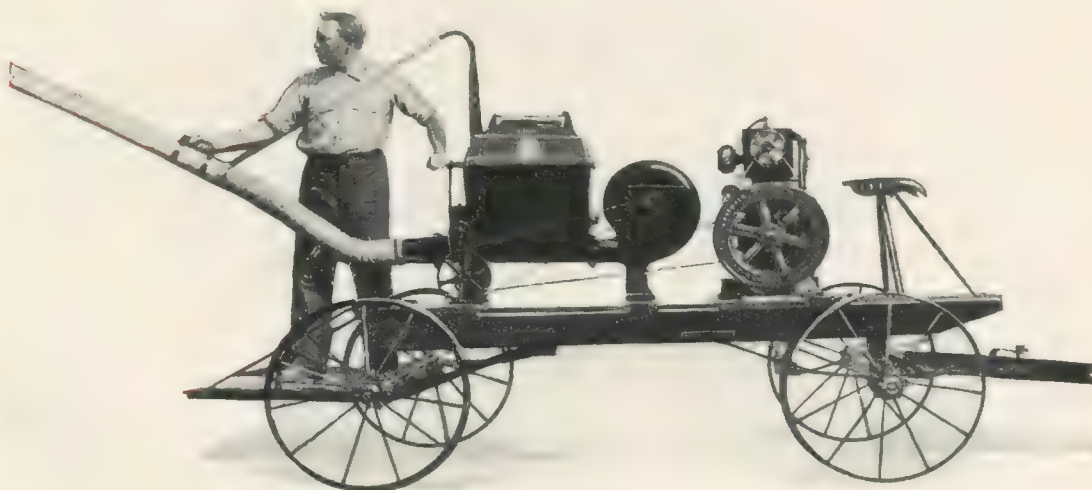
DISCHARGE PIPE

The standard discharge pipe is 5 feet in length and is made of galvanized metal. The discharge pipe is equipped with a handle making it easy for the operator to manipulate. The discharge pipe coupling which

connects the galvanized discharge pipe to the air chamber of the dusting machine is made of especially flexible re-enforced rubber. There is complete freedom of motion in all directions and at the same time no resistance to the flow of materials regardless of the angle at which the discharge pipe is held.

SPECIAL DUST DISTRIBUTORS

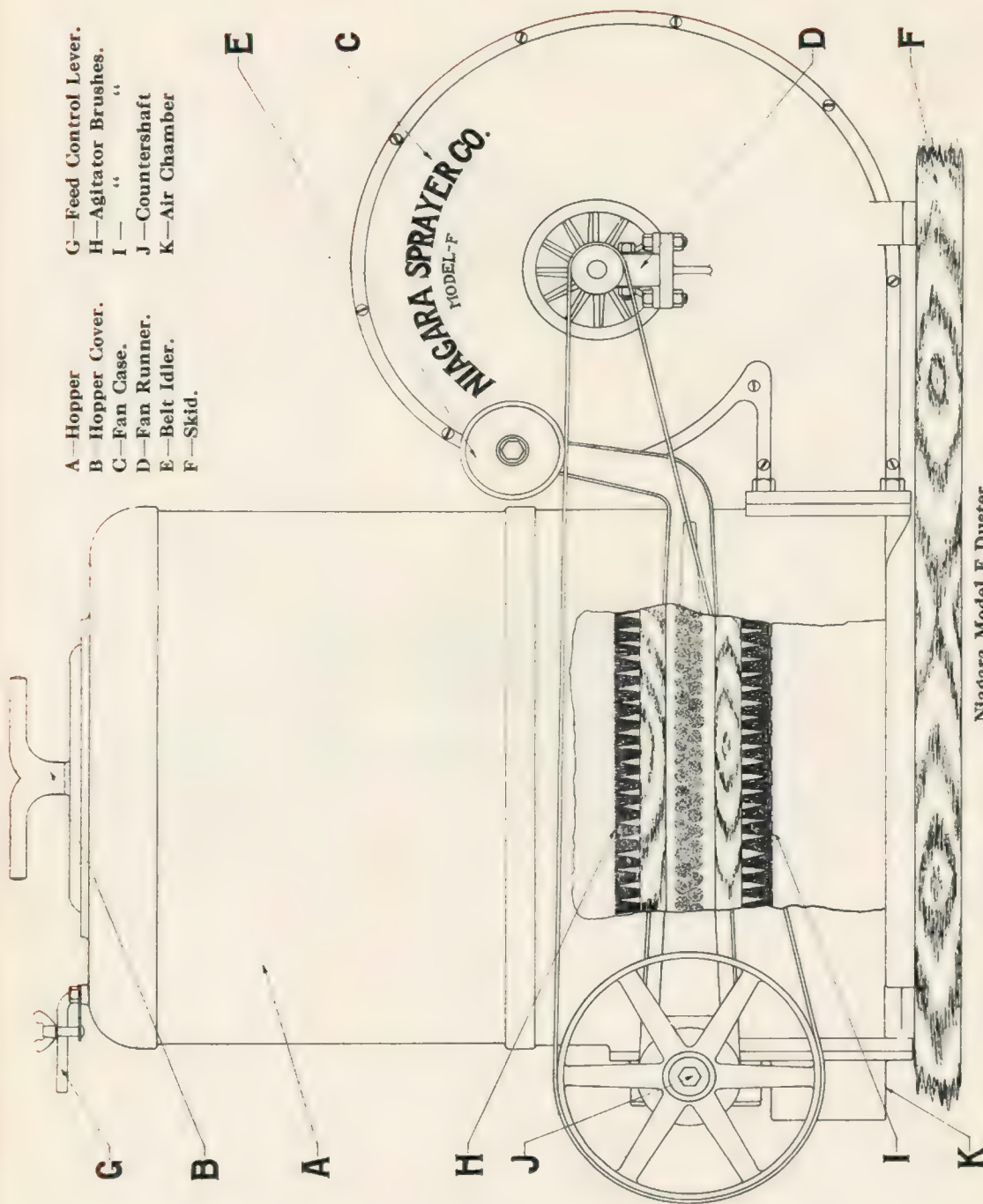
Special dust distributors for special purposes, such as low growing crops, are made up for the different type dusters when desired. These special distributors consist of adjustable individual outlet pipes for the purpose of discharging the material directly over the plants in cases where they are planted in rows. The **Niagara Cotton Duster** pictured in the succeeding pages, is equipped with one of these special discharge attachments.



Showing special wagon on which Niagara dusters
are mounted when specified

WAGONS FOR MODELS F & W

An especially designed strong, light wagon for carrying **Models F & W** is furnished when desired. This wagon has broad iron wheels and a low center of gravity. A drop platform is attached behind the wagon so that the operator may manipulate the discharge pipe from a low position, and at the same time avoid the inconvenience of brushing aside limbs and twigs when passing between rows of trees.



MODEL F

This is the largest type orchard machine and is designed for large acreages and for large trees particularly, although it is equally well adapted for peaches, pears and plums, and other trees of this type. Its weight is a trifle over 300 lbs. It has sufficient capacity for treating 40 acres of



New Model F on skids

mature apple orchard a day. It requires a 3 horse-power engine to operate this duster. The diameter of the discharge pipe in this model is 4 inches. **Model F** is furnished in two manners:

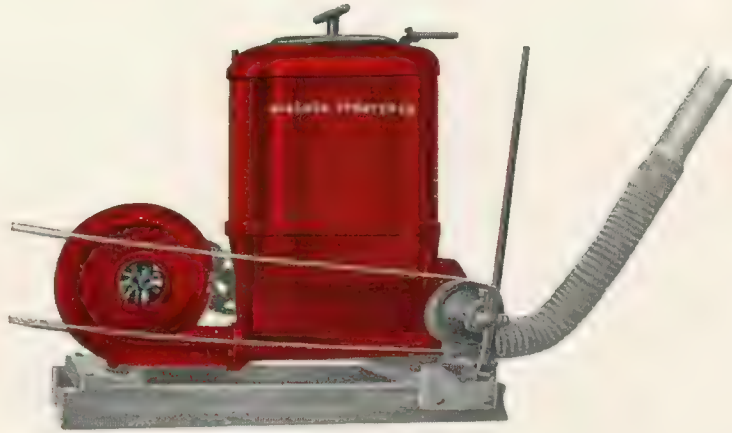
First, on skids only, equipped in such a manner that the customers engine may easily be attached.

Second, on skids complete with 3 horse-power engine.

The latter equipment when set up is ready for use. There are no extras or accessories of any kind necessary with the Niagara duster when furnished complete.

MODEL W

This is a small orchard machine adapted particularly for small trees, small acreages or low growing crops, such as strawberries, etc. This model is identical in all features with the large **Model F**, the only points of

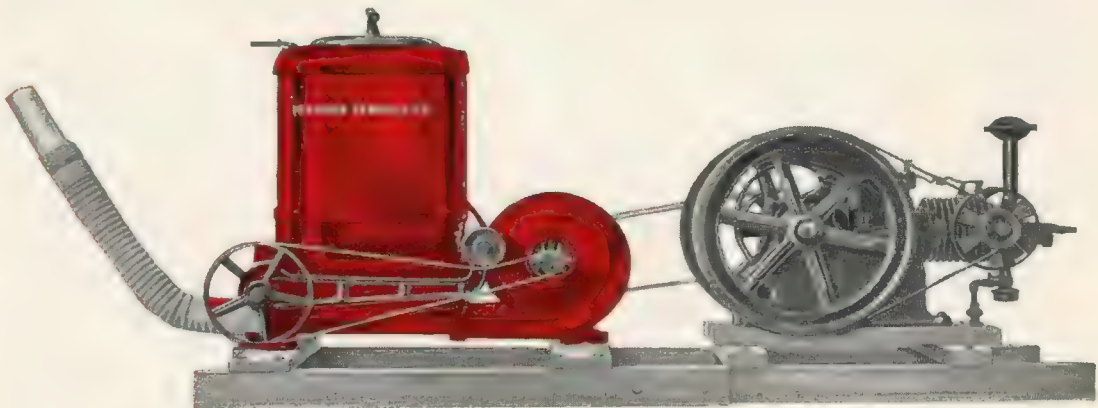


Model W on skids

difference being that it weighs about 100 lbs. less, has a $2\frac{1}{2}$ -inch discharge pipe instead of a 4-inch. It has a smaller fan, thus making it possible to operate the **Model W** with a $2\frac{1}{4}$ horse-power engine. **Model W** is furnished in two manners:

First, on skids only, equipped so that the customers engine may be readily attached.

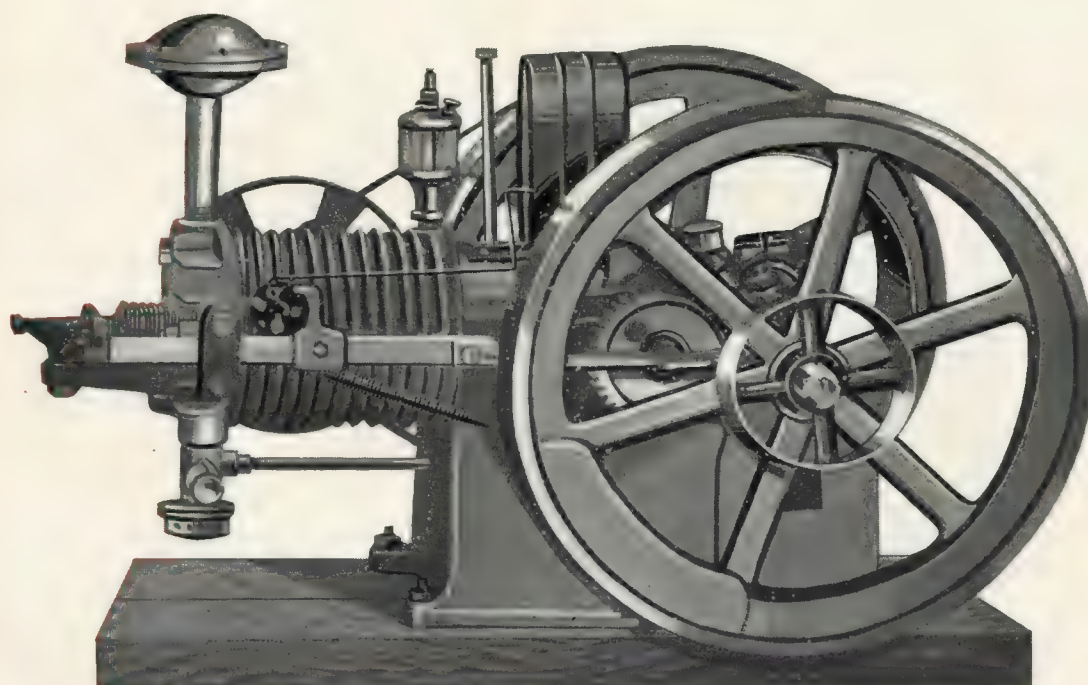
Second, on skids complete with $2\frac{1}{4}$ horse-power air-cooled engine.



Model W on skids with engine complete

GASOLINE ENGINES FOR DUSTERS

Niagara Dusters are equipped for the most part with air-cooled engines which were adopted by us after the most careful consideration of many makes and types of engines. The air-cooled feature eliminates entirely all of the inconvenience of replenishing the water supply and the danger of freezing in cold weather. The engines furnished with **Model F** are of the



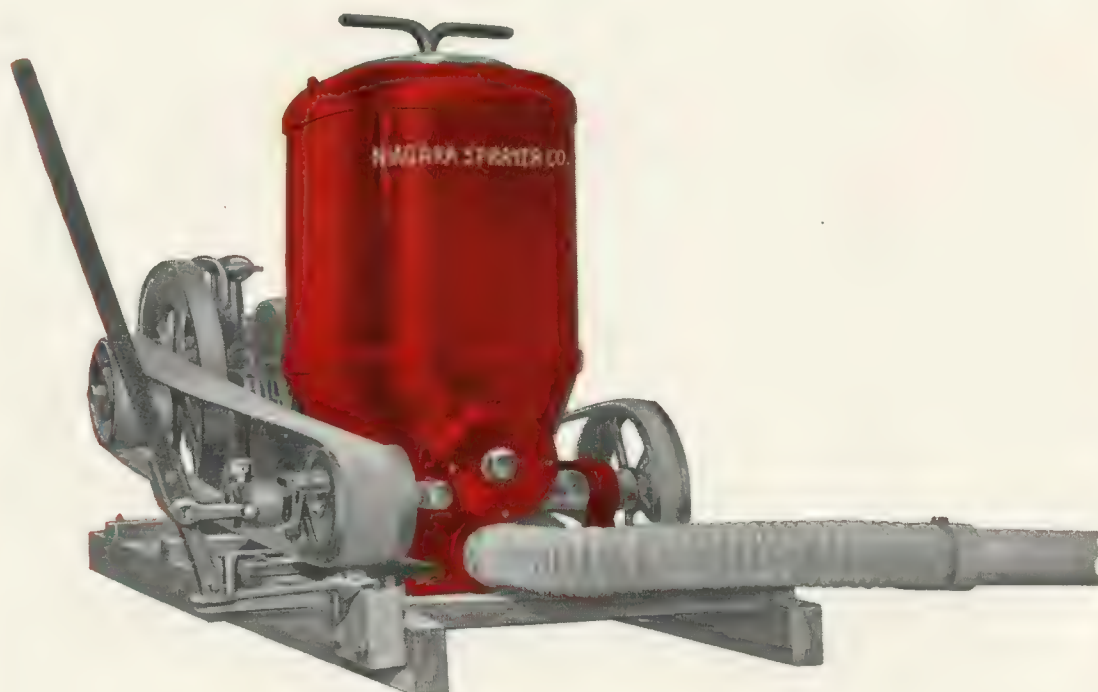
This sturdy engine is regular equipment with
Niagara Model W dusters

3 Horse-power type and the **Model W 2 $\frac{1}{4}$ Horse-power type**. All are of the highest quality possible to produce, are equipped with built in, gear-driven magnetos, thoroughly reliable in every respect.

Not only are the engines with which our dusters are equipped, guaranteed by us but also by the engine manufacturers so that the user of our complete equipment is thoroughly protected with reference to a reliable and long lived power plant.

SKIDS

Every duster is equipped with hardwood skids, which are of sufficient strength and size to accommodate any farm gasoline engine which may be desired to place upon it for operating the duster. By the use of skids the dusting equipment is always ready for instant use; can be easily handled and shifted from one wagon to another or to the barn floor when not in use.



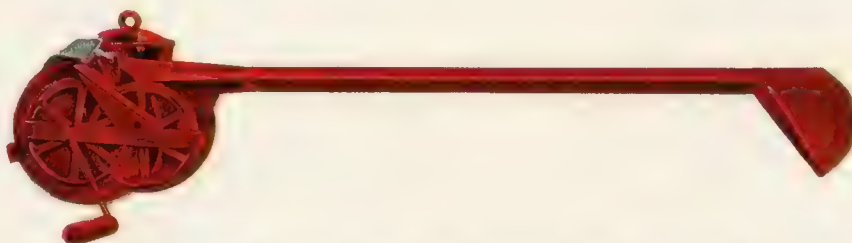
End view of Model F

REPAIRS

The simple, strong construction, and the fact that the dusting chemicals do not come in contact with the working parts of the machine, tend to reduce the necessity of repairs to a minimum. However, if, through accident, carelessness or other causes repairs become necessary, we are prepared to give very prompt and efficient service. Repair list and prices sent on request.

NIAGARA BLOWER GUN, CRANK TYPE, HAND OPERATED

The **Niagara Blower Gun** is an improved type of hand-duster which embodies many of the **patented** features of the larger engine-operated models, including the brushing and feeding devices. This gun is made of sheet metal and is very strong and durable. In operation it is suspended from the shoulder of the operator and the fan is rotated by means of a hand crank. This gun is especially designed for low growing crops such



Niagara Blower Gun, crank type, hand operating

as potatoes, strawberries, tomatoes, cotton, tobacco, etc., and also is adapted for treating small trees in young home orchards, etc. The weight of the blower gun is about 11 lbs. and its carrying capacity of dusting material is about 15 lbs.

The mechanical construction of the Niagara Blower Gun is very ingenious, simple and durable. There are exceedingly few working parts and the materials used in the construction are of the best. The gears and pinions, for example, are **cut** rather than cast for the purpose of making the operation of the gun smoother and easier.

Niagara Blower Guns are shipped complete in heavy cardboard individual cartons.

NIAGARA HAND DUSTER

This little duster is designed for use around the home on ornamental shrubbery, gardens, vegetables, house plants, etc. It is extremely light and simple and will not get out of order. This hand duster is sold only in combination with a one pound package of our **All-in-One Mixture** described elsewhere in this booklet and is accompanied by an attractive **Garden**

Guide describing the treatment of various insects and diseases prevalent around gardens and home grounds. These three articles are contained in a single attractive carton. One is needed in every home.



Niagara Hand Dust Gun

All that it is necessary to do to make the treatments is to pour some of the material from the can into the hopper of the dusting machine and go to work. The use of the dry mixture eliminates all of the untidiness of handling small liquid sprayers and at the same time, there is no danger of staining the house or other painted objects around the home grounds. These features combined with complete effectiveness in controlling insects and diseases make the **Niagara Hand Duster** outfit the logical method for protecting the garden and home grounds.

Many private green houses and many commercial florists are now discarding the old system of fumigation in favor of the new dusting method as they have found that the work is not only easier but quicker and con-



Cover feature showing extra large opening at top of hopper for filling; on Model F and Model W

stitutes a considerable saving in time and money. The small **Niagara Hand Dust Gun** is particularly adapted for this type of work. Full instructions for making the applications and treating the various insects and diseases accompany the gun.

NIAGARA TRACTION POWER COTTON DUSTING MACHINE

Niagara Traction Power Cotton Dusting Machine is a recent development, built especially for fighting **Boll Weevil** in the cotton fields of the south. While this machine is designed especially for cotton, it will no doubt find many adaptations for other crops similar to cotton. The **Niagara Cotton Duster** has a 48-inch tread, is mounted on two wheels having an arched axle with 42-inch clearance. It receives its power from the traction of the large iron wheels as the machine is drawn over the ground.



Niagara traction power cotton duster

A special catalog describing the cotton dusting machine in detail, giving complete instructions for treatment of **Boll Weevil** will be furnished to those interested in this type of duster.

DUSTING MATERIALS

NIAGARA DRY ARSENATE OF LEAD

Niagara Dry Arsenate of Lead, which is a component part of the Niagara Dusting Mixtures, is a chemically pure Arsenate of Lead which is exceedingly light and is prepared by a special process which makes it the very best possible Arsenate of Lead to be used for the dusting purposes. It contains 33% arsenic oxide, which is a very effective poison for chewing insects. This arsenic is so closely combined with the lead that there is practically no free arsenic, and therefore, no danger of burning the foliage. The purity and unusually activeness of the new Niagara Dusting Arsenate of Lead make it distinctive for its quick-poisoning qualities.

Its unparalleled fineness makes possible an even and uniform distribution as well as great adhesiveness. This Arsenate of Lead cannot freeze, dry out, cake or lose its strength, and therefore, like the other Niagara Dusting Materials, can be kept indefinitely without deterioration. Every effort has been made to obtain the Arsenate of Lead for Dusting purposes which would be the best that it is possible to produce.

SULPHUR

The success or failure of dusting operations depends largely upon the fineness and purity of the fungicide and poison which is used.

Perhaps the greatest step in the development of dusting in the last few years has been the production of an extremely finely-divided pure sulphur which approaches in an effective measure the finely-precipitated sulphur which constitutes the valuable fungicidal ingredient of Lime and Sulphur Solution.

It has been demonstrated that the fungicidal value of sulphur is directly proportional to its fineness. This is also true of its sticking qualities. Therefore, it is little wonder that when a sulphur was produced which would pass a 200-mesh screen (twice as fine as wheat flour) that results were obtained which were wholly beyond the expectations of those who were interested in the dusting experiments.

Niagara Dusting Sulphur is 99½% pure and is guaranteed to pass a 200-mesh screen. Sulphur of this fineness will thoroughly and uniformly cover both surfaces of foliage and fruit. The sticking power is unexcelled.

Sulphur of this type was used in all of the Experimental work which was carried on in various Experimental Stations the past few seasons, and it was sulphur of this type which gave the remarkable results obtained by com-

mercial fruit growers in Western New York and other large fruit growing sections of the country.

We believe that we have the largest commercial plant capable of producing sulphur in this degree of fineness and developments are now under way which indicate that in the near future Niagara dusting sulphur will be even finer and better than the remarkable material which has heretofore been furnished.

TOBACCO DUST

The development of a ground tobacco dust having practically a 200-mesh fineness, is one of the recent advanced steps in the manufacture of dusting materials. Niagara tobacco dust is used as an ingredient of some of the dusting mixtures, both for its insecticidal value and as a "filler" for other materials. This finely powdered tobacco dust has successfully controlled apple aphid and pear psylla and many other sucking insects. The killing power of this material depends upon its nicotine content and the thoroughness with which the covering is made. The fineness and light fluffiness makes the distribution of this material especially thorough when used in the power duster.

CALCIUM ARSENATE

Niagara dry calcium arsenate is a fine fluffy arsenical which is now coming into quite general use as a substitute for arsenate of lead, largely because of its quicker killing power and higher arsenic content. The principle use which calcium arsenate finds in dusting at the present time, is the application to cotton for the control of Boll Weevil and to tobacco for the control of such insects as the horn worm and flea beetle. The physical character of calcium arsenate makes it especially suitable for dusting purposes and it bids fair to replace arsenate of lead in standard dusting mixtures in the near future. **Niagara calcium arsenate** is manufactured in our own factories under the careful supervision of experts, and we believe is the highest grade material of this type possible to obtain. It contains 40% arsenic oxide and less than $\frac{3}{4}$ of 1% of water soluble arsenic.

POWDERED BORDEAUX MIXTURE FOR DUSTING

This material is designed for use against diseases which are not susceptible to the sulphur treatment and is furnished either in the undiluted form or as an ingredient of mixtures containing arsenate of lead, sulphur, or other materials. The new type of Bordeaux mixture for dusting contains **22% metallic copper**, which it will be readily seen, is about 15% higher in copper content than ordinary commercial powdered Bordeaux mixtures.



1



2

- 1—Nature brings the blossoms.
- 2—Dusting brings the quality.
- 3—Quality brings the money.



Note: As this catalog goes to the press, there is being developed a very promising copper sulphate fungicide for dusting in the form of a dehydrated pure copper sulphate. This material seems to hold great promise for dusting purposes.

CONTACT DUSTS

Ever since dusting first came into use a great effort has been made to produce a contact insecticide that can be used in the form of a dust for killing such sucking insects as **aphis, pear psylla, apple red bug, etc.**

We have experimented on a very large scale during the last two seasons with a new tobacco product and the result has been that we are now ready to recommend a contact insecticide dust which will control pear psylla and apple aphis, and similar sucking insects. By dusting this material on the trees with the Niagara Duster an infinitely superior distribution can be obtained, and as it is necessary to hit these insects in order to kill them, it can readily be seen that the dust method offers great advantages for the control of these pests.

NIAGARA SOLUBLE SULPHUR COMPOUND FOR DUSTING

For several seasons there has been a constantly growing demand for a material which could be used for dusting in the dormant season for the control of San Jose scale, Peach Leaf Curl, etc. After extensive experimental work, it has finally been concluded that **Niagara Soluble Sulphur Compound for Dusting** which is a specially prepared adaptation of regular **Niagara Soluble Sulphur Compound** used for liquid purposes, may be successfully used for dormant dust treatments for the control of San Jose Scale. This material is a deliquescent powder which, when blown from the dusting machine absorbs moisture from the air and turns to tiny beads of liquid on the tree.

The material being deliquescent makes it much more difficult to handle than the ordinary sulphur and arsenate of lead mixtures and more care must be exercised in placing the material in the hopper and cleaning the hopper after the operation, as if the material is allowed to stand exposed to the air for any length of time it will have a tendency to harden and cause difficulty with the feeding device.

Niagara Soluble Sulphur Compound for dusting will find its principal use in those orchards which are largely clean of San Jose Scale at the present time but which from year to year obtain from outside sources localized infestations on a few trees in one or more sections of the orchard. By using

Niagara Soluble Sulphur Compound for dusting on these few infested trees, the scale may be kept from spreading and the necessity for treating the entire orchard will be obviated.

So far as dusting peaches for the control of Peach Leaf Curl is concerned, experiments now under way seem to indicate that it is going to be possible to develop a material for this purpose, but at the present writing it is impossible to make a definite recommendation on the control of this disease by dormant dusting.

CALCIUM ARSENATE FOR DUSTING POTATO BUGS AND SIMILAR FIELD CROPS AND GARDEN INSECTS

The new insecticide Niagara Calcium Arsenate powder is quite similar to Arsenate of Lead, except that it contains a higher percentage of arsenic oxide which is the valuable ingredient of any arsenical stomach poison. During the past three seasons, Niagara Calcium Arsenate has been used extensively for killing Potato Bugs and similar insects as well as Cotton Boll Weevil and a number of other hardy pests. The material contains at least 40% Arsenic Oxide and needs to be used only at the rate of 6 to 8 pounds per acre, clear, for the successful control of Potato Bugs.



DUSTING MIXTURES

In order to make combined applications of fungicides and insecticides in the dust form, the practice has been the same as with spraying materials, namely, the use of dusting mixtures. A number of these mixtures have been thoroughly standardized and are now recognized as the best combination for the general purpose designed for. We list and furnish a number of these thoroughly tested and recognized standard mixtures and advise and recommend that these standard dust mixtures be used wherever possible. On the other hand, should it be desired, we are in position to furnish any kind of special mixture desired by the customer.

In order for a dust mixture to be efficient and economical, it is necessary that the ingredients be accurately, thoroughly and homogeneously mixed. Special machinery has been designed to produce these homogeneous mixtures and as the importance of the protection afforded to crops by these mixtures will allow of no discrepancies, we strongly urge that only Niagara tested mixtures and materials be used.

For commercial dusting purposes, Niagara dusting materials are put up and shipped in 100-pound double cotton bags. The 100-pound bag makes a very convenient package to be carried on the dusting outfit.

NIAGARA STANDARD COMMERCIAL DUSTING MIXTURES

NIAGARA 90-10 MIXTURE

This combination contains 90% pure Sulphur and 10% Arsenate of Lead. It is the most widely used dusting mixture for controlling chewing insects and fungus diseases. It is particularly adapted to the treatment of apples for the control of Apple Scab, Codling Moth, Bud Moth, Case Bearers, and similar troubles.

NIAGARA 85-15 MIXTURE

This combination consists of 85% pure Sulphur and 15% Arsenate of Lead, and while very popular it is not as widely used as the 90-10 mixture. This material is particularly adapted to strawberries for the control of Weevil and is used in treating apples when heavy infestations of Codling Moth occur or where it is necessary to fight some hardy leaf eating insect like the Leaf Roller.

NIAGARA 80-10-10 MIXTURE

This combination consists of 80% Sulphur, 10% Arsenate of Lead and 10% Lime. This is the standard peach dusting mixture and is used in practically all parts of the country where peaches are grown, for the control

of Brown Rot, Scab, and Curculio. This mixture is not only very effective on peaches but has many other uses as well, and will not burn the tender foliage or fruits even on peaches, or such tender leaved plants as Japanese plums.

NIAGARA 95-5

This combination consists of 95% pure Sulphur and 5% Arsenate of Lead. It finds its principle use in peach sections where Curculio is not prevalent enough to warrant the use of heavy doses of Arsenate of Lead. It may be readily seen that the cost of the dusting mixture may be considerably reduced by using this combination if chewing insects are not present in large numbers.

NIAGARA CONTACT SPECIAL

This new and especially prepared dusting mixture is used as a contact insecticide for the control of such sucking insects as are usually combatted in liquid spraying by the use of nicotine, whale oil soap or kerosene emulsion. It has proven most effective for Apple Aphis and Red Bugs, Pear Psylla, etc. *This mixture contains no arsenate of lead.*

It, however, has in addition to its value as a contact insecticide, considerable fungicidal properties. The guaranteed nicotine content of this material is 2%. **Niagara Contact Special** is not only well adapted for use against sucking insects on fruit trees, but it is also very successful when used against such pests as Cabbage Lice, Potato Aphis, and many other sucking insects which occur on low growing crops.

NIAGARA ALL-IN-ONE MIXTURE

This preparation is a complete contact insecticide, fungicide and stomach poison for chewing insects and is the most effective general-purpose dust combination which it has so far been possible to secure. This material contains all of the ingredients of the **Niagara Contact Special** described on preceding page, but also contains 10% of Arsenate of Lead. It is particularly recommended for garden and shrubbery work, and also in commercial orchards and fields where a heavy infestation of sucking insects makes the application of a strong and effective material necessary.

NIAGARA THREE-IN-ONE MIXTURE

Niagara three-in-one mixture is similar to the **Niagara all-in-one mixture**, in that it contains both contact insecticide, stomach poison for chewing insects, and fungicide, but it differs from the **All-in-one mixture**

in that the nicotine content is furnished by ground tobacco stems instead of nicotine sulphate, and the nicotine content therefore runs about $\frac{1}{2}$ of 1%. This material is the old established **Three-in-one mixture** which has given such successful results for years and is recommended particularly for treatment of apples, etc., where the infestation of sucking insects is not serious enough to threaten the crop. The **Niagara Three-in-one mixture** is the most popular all-purpose material used in commercial orchard and field dusting.

NIAGARA POTATO MIXTURE

For the purpose of furnishing a material particularly adapted for use on potatoes, garden vegetables, tomatoes, etc., a special mixture has been provided which contains proper proportions of Calcium Arsenate, Bordeaux mixture and Sulphur, to take care of most of the troubles to which these crops are heir. **Niagara Potato mixture** if applied frequently and intelligently will give as good or better results than spraying with the same materials by the liquid method. The **Niagara Potato mixture** used at the rate of 10 to 15 lbs. per acre gives the plants a treatment with more copper than is obtained from an ordinary treatment with 4-4-50 Home-made Bordeaux mixture. It is highly recommended by commercial potato growers and truck gardeners.

FILLERS

In some instances it is desirable to use what is known as "fillers" in dusting mixtures, as for instance, mixtures for dusting peaches. These are inert materials, the only purpose of which is either to prevent the possibility of burning by Arsenical injury or to dilute the poison and fungicide.

Niagara dusting mixtures are "filled" with a special grade of extremely fine hydrated lime when such fillers are made necessary.

KIND OF DUSTING MATERIAL TO USE

Every local condition requires special advice for the most intelligent recommendations for materials to use. However, as a guide to the selection of materials best adapted to particular purposes, the general outline following may be used:

When it is desired to fight fungus diseases which are susceptible to the Sulphur treatment, materials containing a high percentage of Sulphur or Sulphur pure should be used. When fighting fungus diseases which are not susceptible to the Sulphur treatment such as Bitter Rot, Cedar Rust, etc., Niagara Powdered Bordeaux Mixture is recommended or Niagara Potato Dust which contains a high percentage of Bordeaux Mixture. When

chewing insects are to be combated, materials containing at least 10% Lead Arsenate should be applied.

The usual practice on apples is to combine ninety parts of Sulphur and ten parts of Lead Arsenate in a mixture called **90-10 Mixture** for the purpose of making a combined application for chewing insects and fungus diseases. In dusting this same combination on peaches, 10% of Lime is usually added to obviate any possibility of injury to the foliage. This peach dusting combination is known as the **80-10-10 Mixture**.

When it is desired to combat sucking insects such as Pear Psylla, Aphids, etc., the **Contact Special** should be used. This is strictly a **contact** insecticide. Many times it is desirable to combine the contact insecticide in the same application with Arsenate of Lead and Sulphur. In this case, it is desirable to use the **All-in-One Mixture**. The **All-in-One Mixture** contains contact insecticide, stomach poison for chewing insects and sulphur for fungicide.

For potatoes and truck crops, the **Potato Special Mixture** containing Bordeaux compounds and Calcium Arsenate is most desirable. Local official advice from County Agents or Experiment Stations should be sought if the grower is unable to determine definitely in his own mind which is the best material for his purpose.

SCHEDULE FOR DUSTING APPLICATIONS

A limited space makes it impossible to give a general dusting schedule which will cover every fruit growing section and every different kind of plant which is now being treated by the dusting method. In general, the same schedule which has been followed for liquid spraying may be followed with the dusting method except in such cases as epidemic fungus diseases like Apple Scab, when critical situations must be met by considerable personal judgment on the part of the fruit grower. Different measures are necessary for different diseases in different localities. In general, the rapidity of the dusting method has made it possible to deviate from the accepted spraying schedule and to make applications at critical periods throughout the entire season. In many cases of epidemic fungus diseases, it has developed that better results may be secured in the use of dust by making more frequent applications than are usually advised for the liquid spraying process. A working knowledge of the life cycle of the insect pests and fungus diseases which are to be combated together with the general characteristics of the materials which are to be used, both considered in the light of the weather conditions prevailing at the time of, or previous to the application, makes possible the formulation of intelligent and successful dusting schedules.

QUESTIONS WHICH FREQUENTLY ARISE CONCERNING DUSTING

HOW MUCH DUSTING MATERIAL IS IT NECESSARY TO USE PER TREE?

The table on the following page answers this question in an average and comprehensive way although the figures should not be taken as accurate as every individual orchard presents a problem of its own with respect to the quantity of material required and the experience of the operator and the seriousness of the insects and diseases are other factors which enter into the quantity of material required for each application.

HOW DOES THE DUST STICK TO THE FRUIT AND FOLIAGE?

Niagara dusting materials are ground to such a fineness that the tiny particles will pass through a screen having 200 meshes to the inch. These tiny particles of material are so fine that they lodge securely in the pubescence or tiny hairs which cover the fruit and foliage and are securely held there. The natural adhesiveness of the materials is also a factor. It has been clearly demonstrated in field and laboratory that dusting materials of proper fineness adhere to the foliage or fruit fully as long as any liquid sprays. Most materials used for dusting purposes are insoluble in water and therefore will not dissolve and wash off by rains. One only has to glance at the dusty windshield of his automobile which has passed through wind and rain without becoming washed off or dislodged to convince himself that finely powdered particles of dust will adhere to even smooth surfaces with great persistence.

IS MUCH MATERIAL WASTED IN DUSTING?

An experienced operator will not waste any more dusting material in a day's work than is usually wasted in liquid spraying. In fact, the material which seems to be wasted is termed "drift" and this in general, settles in other parts of the orchard so that in reality a very small percentage of the dust is lost.

CAN THE DUST BE USED ON WINDY DAYS?

High winds are no more favorable to dusting than they are to liquid spraying. Applications are best made early in the morning or late in the evening when there is little or no wind although a light wind carries with it no disadvantages. If it is necessary to dust in the wind, it is desirable that the applications be made from at least two sides using the prevailing wind from either direction as a carrier for the material the same as is generally practiced for liquid applications.

**APPROXIMATE TABLE OF QUANTITIES OF DUST TO
USE AT EACH APPLICATION**

Kind of Plants	Age 1 to 5 Years	Age 5 to 10 Years	Age 10 to 15 Years	Age 15 to 20 Years	Age Above 20 Years	Average for all Ages
Apples.....	1/8 lb. per tree	1/4 to 1/2 lb. per tree	1 lb. per tree	1 1/2 lbs. per tree	2 lbs. per tree	.....
Peaches.....	1/8 " " "	" " "	1/2 " "	" "	" "	.....
Pears.....	1/8 " " "	" " "	1/2 " "	1 lb. per tree	1 lb. per tree	.....
Plums and Prunes..	1/8 " " "	" " "	1/2 " "	1 " "	" "	.....
Cherries.....	1/8 " " "	" " "	1/2 " "	1 " "	" "	.....
Bush Fruits.....	.....	.....	.....	.....	.....	25 to 30 lbs. per acre
Potatoes, etc.....	.....	.....	.....	.....	.....	10 " 15 " "
Strawberries.....	.....	.....	.....	.....	.....	30 " 40 " "
Garden Truck.....	.....	.....	.....	.....	.....	10 " 15 " "
Grapes.....	.....	.....	.....	.....	.....	25 " 30 " "
Tobacco and Cotton	.....	.....	.....	.....	.....	6 " 12 " "

IS IT HARMFUL TO BREATHE THE DUST?

As far as is known, no harmful effects have been recorded from breathing the dust, likewise, animals pastured in orchards which have been recently treated with dust are not effected in any way by the material which may have fallen to the ground. Ordinary precautions, however, should be practiced as there is no need for the operator to come in excessive contact with quantities of dust.

MUST THE DUST BE APPLIED WHEN THE DEW IS ON THE TREE?

Moisture is not necessary to make dust stick. In general, one time of day is as good as another for making the applications so far as the actual results are concerned. However, if it is possible to take advantage of humid conditions following a dew or light rain, it is always better to use the dust at this time as the moisture not only "sets" the material much faster but it is also true that humid conditions mean a still and quiet atmosphere which, of course, is very favorable for conducting the dusting operations.

WILL THE DUST BURN?

Excessive quantities of dust applied to trees particularly such as peaches or Japanese plums have been known to cause russetting but in general, ordinary applications are entirely harmless and may be used on any kind of trees without danger of burning the foliage or fruit. Conditions which cause burning with liquid spraying will not cause burning with dusting and dusting may be said to be the safest form of applying any kind of insecticide which has so far been devised.

ARE GOGGLES NECESSARY FOR MEN AND HORSES?

Many operators wear goggles while dusting unless the wind is such that he may keep clear from the dust. Horses experience no trouble on account of dust in their eyes.

HOW DO YOU TREAT SULPHUR IN THE EYES?

Sulphur in the eyes has a tendency to cause them to smart and cause discomfort. The trouble is not due to poisoning of any kind but is merely a mechanical irritation of the eyelids on account of the presence of small particles of Sulphur. Avoid rubbing as much as possible and wash out the eyes with sweet milk or cream for quick relief from this trouble.

GENERAL DIRECTIONS FOR DUSTING

After the machine is set up complete ready for work, it is well for the grower to familiarize himself with the operation of the machine by using some ordinary hydrated lime or other finely powdered, inexpensive material and practicing a few rounds throughout the orchard, to become used to the manner in which the material discharges from the machine and the amount of material which is necessary to use in his particular orchard in order to accomplish a thorough envelopment and covering of the tree.

In starting out with the regular operations, it is well to carry a supply of the materials on the dusting outfit or distribute them at convenient points in the orchard so that they may be picked up without delay when needed. This eliminates the necessity of going to and from the source of supply which is one of the great time saving features of the dusting method. It has been commonly misunderstood that it is not necessary to dust trees from both sides. It should always be borne in mind that dust treatments should be made from at least two sides of the trees in order to accomplish the desired results. No grower would consider that he had made a thorough application by liquid spraying if he had applied the materials to only one side of the tree. Neither has the dust user made a thorough application if he has only applied the dust to one side of the tree. In dusting, the application to both sides of the tree may be accomplished by driving twice in each row and dusting on either side when the conditions are quiet with reference to wind, or by swinging the pipe alternately from side to side as the outfit passes slowly between the rows. The most desirable method, however, of accomplishing this application to both sides of the trees is to dust with the wind on two different days when the wind is in opposite directions. In this way, the effective covering by the "drift" is more easily accomplished. The handling of the discharge pipe should be such as to effect the most thorough distribution of the material as much depends upon the size and shape of the trees, as well as the general typography of the orchard, individual cases must be studied out in order to secure the best covering. In most cases where orchards are on fairly level ground, it will be found that a satisfactory method for distributing the dust will be a steady, vertical sweep of the pipe starting from the base of the tree and throwing the material to the top; repeating this operation rapidly as the outfit passes the tree which is being treated.

In most orchards, thorough work may be accomplished while the outfit is in continual motion. Unlike spraying, it is not necessary to stop at each tree. For particularly large trees, it is not necessary to use a longer outlet pipe but only necessary to manipulate the standard pipe in such a manner

as to lift the dust higher than in ordinary practice. This may be accomplished by giving the discharge pipe a flirt as it comes to the highest vertical position.

For treating small trees which have considerable space between them, the method usually practiced is what is known as "puffing." This is accomplished by simply allowing a "puff" of dust to be discharged sufficient to envelop the tree to be treated as the machine passes by.

Contrary to liquid spraying, the parts of the trees less likely to receive the proper treatment are the lower branches or those nearest to the machine. However, the "drift" always floats several rows through the orchard and thoroughly covers the lower branches so that the operator should not be alarmed if he finds that he is missing some of the lower branches on the particular row in which he is doing his work as he will find that the branches he thinks he has missed will be covered after he has passed on through the orchard several rows.

The ideal time for making dusting applications is early in the morning or late in the evening when the wind conditions are quiet and when there is slight dew or moisture on the trees to assist in sticking the tiny particles of dust to surfaces.

A little practice in handling the feeding regulator will demonstrate to the operator what the best quantity of dust for his particular orchard is. This factor varies so greatly in every orchard that it is impossible to make definite recommendations. In general, it may be said that the trees should be enveloped in a cloud of dust sufficient so that under the magnifying glass, the leaves show a thorough and uniform covering. Many times thorough applications are made but are not visible to the naked eye and in dusting, one should not be disappointed if not able to see a heavy coating of material on the trees as in the case of liquid spraying.

Finally, always bear in mind that dusting is not a panacea and is not operated on the principle of Alladin's Wonderful Lamp. The same amount of intelligence and study and care is required for successful dusting as is required for successful liquid spraying and a man who cannot successfully do a job of liquid spraying cannot successfully use a dusting machine.

DUSTING APPLES

One of the most distinct successes of the dusting method with reference to fruit has been the treatment of apples. This is natural inasmuch as the pioneer experimental work on the new improved machines and materials was carried on in apple orchards, particularly with reference to the control of such diseases as Apple Scab and such orchard pests as Codling Moth. Practically every apple producing section of North America from the

Annapolis Valley of Nova Scotia to California have turned over a large percentage of the commercial acreage to dusting for various purposes.

On account of the fact that dusting materials are insoluble in water and are not effected in any way by moisture, the foliage retains its original rank green appearance while in the sprayed orchards the chemical action of the materials used in the liquid form have a tendency to weaken and devitalize the leaves of the tree so that they, in a measure, cease to perform their full function. This difference in the quality of the foliage is not only important so far as the maturing of the crop which is on the trees during the current season is concerned but also is important in forming strong, healthy fruit buds for the succeeding season. Dusting apples is safe, practical and economical.

In general, **the Model F** machine is recommended for apple orchard work except in cases of hillside orchards, where **Model W** is some times preferred.

DUSTING PEACHES

For the control of Brown Rot, Scab and Curculio on peaches, no method of treatment has ever been discovered which approaches the effectiveness and safety of the dusting method. These troubles have become very prevalent during recent years in the various peach growing sections and ex-



Battery of Niagara Dusters in the largest peach orchard in the world at Highland, Ark., owned by Mr. Burt Johnson

perience has demonstrated that quickness of application and freedom from trouble with scarcity of water supply are important factors in favor of the dusting method. The most limited factor in the summer treatment of peaches when the trees were in foliage has been the fear of injury to the foliage and fruit by the strong chemicals necessary to use in liquid applications. Dusting eliminates entirely these undesirable features and practically insures the grower against foliage injury during the part of the season when a healthy foliage is so essential to the size and development of the fruit.

Not only will applications at the proper time throughout the growing season, protect the fruit against the depredations of Brown Rot, Scab and Curculio in the orchard, but it has been definitely proven that peaches which are dusted with Sulphur about ten days before they are harvested will stand up much longer under transportation conditions and on the market, than untreated peaches.

On account of the fact that in most peach sections the size of the trees is small, the erroneous idea has become prevalent that three or four rows may be treated effectively at one time. While this may be true in a limited number of orchards, as a general practice, it should be discouraged and peach growers should aim to dust their peaches by individual rows, treating them from two sides if possible.

The standard material recommended for dusting peaches is known as **Niagara 80-10-10 Mixture**. Use **Model F** or **W** machines.

Niagara Sprayer Co.,
Middleport, N. Y.

Williamson, N. Y.,
Nov. 5, 1919.

Gentlemen:—

It gives us real pleasure to express to you our complete satisfaction with Niagara Dusters and dusting materials.

As you may recall, when the Cornell experiments were first tried out in this section, we were extremely skeptical and had no faith in the method. We were persuaded to try it out years ago, and the results encouraged us, and for the past two years we have made no liquid applications on our apples and the results are entirely satisfactory from the use of dust. We have dusted our peaches for brown rot and curculio for the past two or three years with wonderful results and would not try to grow certain varieties of peaches after last year's experience were it not for the dusting method. We use 90-10 exclusively for this work.

We have one apple orchard in which aphid is always troublesome, and this year had wonderful results from the use of your nicotine dust.

We use 90-10 dust on cherries and have no difficulty holding the foliage on all varieties. After two years comparison of dust vs. liquid on cherries, we consider dust much superior.

The fact of the matter is, we cannot speak too highly of the dusting method, and you may count on us for endorsement and shall be pleased to speak a good word for your machines and materials whenever our opinion is asked. We have had experience with both methods, and our decision is, NO MORE SPRAYING.

Yours very truly,
J. H. TEATS & SONS.

DUSTING PRUNES AND PLUMS

The same general considerations which have been entered into with reference to the dusting of peaches apply to treatments of plums and prunes. In general, **Model W** is the most suitable machine for this type of work.

Niagara Sprayer Co.,
Middleport, N. Y.

Lewiston, N. Y.

Gentlemen:—

I used the Niagara Duster and materials last season on my prunes. Previous to this season I have had great trouble in holding the foliage on these prunes but by use of the dust I WAS ABLE TO HOLD THE FOLIAGE THIS YEAR TO MY ENTIRE SATISFACTION. I AM WELL PLEASED WITH THE METHOD AND WILL CONTINUE TO USE IT next year.

THE MACHINE GAVE SATISFACTION IN EVERY WAY. The dust seems to distribute more evenly on a dry day than when the dew is on.

The lightness of the outfit, freedom from water, and quickness of the application are very important features of the dusting method.

I BELIEVE FOR FUNGUS DISEASES THAT THE DUSTING MATERIALS ARE AS EFFECTIVE AS LIQUID SPRAYING.

Very truly yours,

(Signed) C. E. NICHOLS.

DUSTING PEARS

While dusting pears for the control of Pear Scab, Codling Moth, etc., has had its place in the development of the dusting method, still the most important use to which the dust has been put in the production of clean quality pears has been for the control of such insects as Pear Psylla, Tarnished Plant Bug, etc. The adaptation of dusting materials which will successfully control such insects as Pear Psylla has opened a very wide field for dusting in the pear orchards of the country. Thorough applications with such materials as Niagara Contact Special or Niagara All-in-One Mixture have successfully handled the most serious infestations of this pest. In dusting pears it is necessary to be exceedingly thorough and it usually requires slightly more material than for the same size and age of apple trees. This is due to the fact that in fighting Pear Psylla, practically all of the insects must be covered in order to be controlled. Treatments should be made from at least two sides of the tree and as frequently as conditions warrant.

Niagara Sprayer Co.,
Middleport, N. Y.

Middleport, N. Y.

Gentlemen:—

I have used your preparation on my pear orchard for control of pear psylla. The method is very rapid and controls psylla, as well as, or better than, any liquid spray I have ever used.

The method is so quick and inexpensive compared to liquid spraying that frequent applications may be made at critical times. These factors are very important in keeping this pest under control.

Yours very truly,

(Signed) JOHN CRAMER.

DUSTING CHERRIES

It has been thoroughly demonstrated in commercial and experimental work that ordinary cherry insects and diseases may be readily controlled by dusting and it is a very common sight to see dusters in operation in the largest commercial cherry orchards of New York and Michigan during the growing season. Particularly for Shot Hole and Brown Rot, the treatments have been very remarkably successful. **Model F** or **Model W** machine are adapted for work of this character.

DUSTING GRAPES

While European grapes have been dusted for years not only in Europe but in this country as well, the treatment of native American grapes or Hybrid types has not been extensively commercialized. During the past year a number of experiments have been carried on in different states which indicate plainly that it possible and practical and feasible to substitute dusting treatments in grape vineyards. This is particularly true since the development of high copper content powdered Bordeaux Mixture. **Model W** duster equipped with a two-way discharge for treating grapes will successfully take care of any of the troubles which have formerly been treated by the use of liquid materials.

TOBACCO DUSTING

For many years crude methods of dusting poisons on tobacco plants have been in vogue in various sections of tobacco growing belts. While these crude methods were successful in a measure, they were not adequate to meet the situation brought about by increased injury from such insects as Horn Worm, Flea Beetle, Cut Worms, Grasshoppers, etc. It has not been until a few years ago that the U. S. Dept. of Agriculture together with a large number of State Experiment Stations, have taken up the matter of dusting Tobacco plants in a commercial way.

The introduction of many improved dusting materials and dusting machines by the **Niagara Sprayer Company** has stimulated the interest in tobacco dusting to such an extent that there is now scarcely a section where tobacco is grown where Niagara products are not found. Such troubles as "burning" or "painting" which were so frequently causes of trouble and loss with the old method of applying insecticides are now entirely done away with by the use of the improved materials and machinery recommended for tobacco dusting purposes. A special booklet describing the machines and materials best adapted for tobacco dusting purposes together with recommendations for the time and methods of treatment for the various insect pests and fungus diseases which are troublesome on tobacco, will be furnished free upon request to our factory office.

DUSTING STRAWBERRIES

No insecticide treatment has come into such quick and substantial favor during the past two years as has the dusting of commercial strawberries, especially in the famous producing sections of New Jersey, Maryland and Delaware. The principal trouble which has been experienced in producing strawberries in these favored sections has been the ravages of Strawberry Weevil which cuts the blossoms and thus reduces the yield.

Practically all of the up-to-date strawberry growers in commercial sections are now adopting the dusting method as a means of poisoning these weevils before they have time to do their damage. The **90-10 Mixture** or the **85-15 Mixture** are the materials recommended, and the duster which has found greatest favor among the larger growers is the **Model W duster**.



Dusting Strawberries in New Jersey

For small acreages, we would also recommend the **Niagara Blower Gun** as being an entirely satisfactory and effective machine for doing this work. The dusting of strawberries is highly recommended by commercial growers as well as Experiment Stations in the strawberry producing states, and every grower of this crop who suffers losses from the weevil damage should equip himself with a Niagara outfit. The New Jersey State Experiment Station at New Brunswick, N. J., and other local Experiment Stations have published bulletins on this subject.

Thomas J. Hedley,
N. J. Experiment Station,
SUMMING UP WORK ON STRAWBERRY WEEVIL:

"It thus appears that the powdered Arsenate of Lead and Sulphur gave the best, in fact almost perfect protection. The plots treated with Arsenate of Lead and Sulphur when in full bloom, were almost as white as snow, while the untreated plots were almost entirely green, with only here and there an occasional blossom."

DUSTING SHADE TREES AND PARKS

The many advantages described for the dusting method and the dusting machines have lead to their adoption in many sections for the purpose of protecting the city street shade trees and park systems against the outbreaks of Tussock Moth, Gypsy Moth, Brown Tail Moth and many other similar pests which are becoming so common in North America.



Dusting in City Parks, Buffalo, N. Y.

The facts that the dusting materials will not discolor painted surfaces and that the work may be done rapidly with a minimum amount of inconvenience to property owners and that the effectiveness of the poison is quick and sure, have lead to the introduction of this system of handling municipal work of this character in many towns and cities.

The machine best adapted to and recommended for street shade tree and park dusting work is the largest size **Model F with 3 Horse-power engine.**

DUSTING POTATOES

The dusting of Potatoes, for the control of ordinary pests and diseases which are susceptible of the treatment, has become very popular in the various potato sections of the country, due to the ease of application and the

rapidity with which the fields may be covered in case of a sudden outbreak of Potato Bugs or similar pests.

Not only have remarkable commercial results been secured from the treatments, but experimental work conducted on Long Island last season gives rather conclusive evidence that applications of Bordeaux Mixture and Arsenate of Lead in the dust form are fully as effective as liquid applications made with home-made Bordeaux Mixture and Paste Arsenate of Lead.

The machines best adapted to potato work are the **Model W** for larger acreages or the **Niagara Blower Gun** for small acreages. The **Model W** may be mounted on a cart or wagon suitable for driving in the rows and the dust may be discharged through the regular discharge pipe equipment by what is known as the "broadcast" method of swinging the pipe from side to side in a horizontal position, or else the distribution may be accomplished by the use of a special distributor, equipped with individual nozzles for each row. These distributors are made only to order according to specifications but usually cover from three to five rows at one trip through the field.

The **Niagara Blower Gun** is a hand operated crank-type duster which is carried on the shoulders of the operator, and does very excellent and very effective work on small acreages where this type of machine will give the service desired.

Niagara Potato Dust described elsewhere in this booklet is the material which is recommended for the general treatment of potatoes. In cases where treatments are made for Potato Bugs only, either Powdered Arsenate of lead or Powdered Calcium Arsenate is recommended as the most desirable poison for quick action against these pests. The average amount of material required to treat an acre of potatoes at each application is about ten pounds. Many of the most successful potato growers are now turning to dusting as a means of solving the problem of proper and timely treatments for their potato fields.

Niagara Sprayer Co.,
Middleport, N. Y.

Poughkeepsie, N. Y.,
August 26, 1919.

Gentlemen:—

With reference to the purchase of potato dust mixture from you, we made these purchases in emergency in order to protect our potatoes from blight, and the mixture seems to have done the work very satisfactorily; in fact, many of our neighbors have lost their entire crop by not spraying, while our crop is coming along nicely.

Thanking you in advance for an early reply, I am,

Yours very truly,

G. R. FINTON.

DUSTING TRUCK CROPS

The dusting of truck crops and low growing field crops such as cabbage, onions, celery, etc., has been the subject of a great amount of technical experimental work and practical field demonstration work in dusting during the past few years. It has been very thoroughly demonstrated that dusting is fully as effective for truck and low growing field crops as liquid spraying has heretofore been. Practically the same materials which are used in the liquid form for the treatment of various insects and diseases which effect these crops is used in the dust form and all of the valuable features of the materials which have been used for years are retained and to them is added the value of the dusting method of making the applications.

Cabbage Aphis, Onion Thrip, Celery Blight, Tomato Blight, Tomato Worms and numberless other pests and diseases have been successfully treated by the dusting method. For small acreages, the **Niagara Blower Gun** has sufficient capacity for ordinary purposes but the **Model W machine** with special attachment for low growing crops or the **Model W machine** with standard equipment is recommended where any large amount of the dusting work is to be carried on.

DUSTING NURSERY STOCK

Many nurserymen have adopted the dusting method for the control of leaf diseases, plant lice, etc., on nursery stock. The many advantages of the dusting method over the old liquid spraying method are especially applicable in the treatment of nursery stock. Our **Model W machine with 2¼ Horse-power air-cooled engine** is recommended for this work.

V. B. Stewart,

New York Exp. Sta., Circular 32.

"In the various experiments discussed herein (rose mildew, leaf spot of currant, mildew of cherry, leaf spot of cherry foliage, of horse chestnut and nursery stock leaf diseases)—the finely ground sulphur in the dust mixture proved as efficient a fungicide as lime and sulphur solution."

DUSTING CORN

The dusting of corn for the control of Corn Ear Worm has recently become popular in some of the important corn growing sections where the Corn Ear Worm is troublesome. While special adaptations of the standard dusting machinery are necessary for the treatment of large commercial acreages, the standard power machines or the **Blower Gun** for hand work will be sufficient to take care of ordinary infestations of this insect.

Commercial results secured in the treatment of corn for this pest have demonstrated that the dusting operations are economical and practicable.

DUSTING ENGLISH WALNUTS

The dusting of English Walnuts especially as they are grown in California, for the control of aphids, has been one of the more recent and picturesque developments in dusting. The original experiments along these lines were carried on by Prof. Ralph Smith of California and it has now become a well established practice among walnut growers to treat their trees for the control of aphids by the dusting method.

The standard **Niagara Model F** machine is used in the walnut groves and the only special adaptation which is required is the addition of a longer piece of flexible hose than is ordinarily furnished with the machine. This makes it possible for the operators to walk under the tree with the hose and discharge the material upwards in a vertical position for the purpose of thoroughly covering the under sides of the leaves as this is the natural habitat of the insect which is to be controlled.

Model F with 3 horse-power engine equipped with special Walnut Dusting Hose is recommended for treating English Walnuts. Complete information in regard to methods and manners of application may be secured from official Experiment Station Bulletins which are now being issued from the California Experiment Station at Berkeley, Cal., or from the California Walnut Growers Association of Los Angeles, Cal.



Niagara Duster in a California Walnut Grove

DUST FOR PECANS

The dusting of Pecans now seems to be coming into great favor in many sections of the country where Pecans are grown on account of the ease and rapidity with which the trees may be treated with arsenicals for the control of Pecan Case Bearers and similar insects.

Inasmuch as the Pecan Trees are very large and difficult to treat, the large **Model F duster and 3 horse-power engine** is recommended for the purpose.

DUSTING CITRUS FRUITS

Citrus growers in California, Florida and Porto Rico were quick to see the many advantages and conveniences in the dusting method as applied to the treatment of oranges, grape fruit, lemons, etc., and in many sections in the citrus belt, dusting is now coming into general use particularly for applying sulphur in the fight against Rust Mite, Red Spider and Sour Scab. Remarkable results have been secured against Red Spider and Rust Mite both in experimental and commercial work, and many large groves have seen fit to adopt the dusting machines for the purpose of fighting these insects only.

Model F and Model W are both adapted for citrus dusting and a choice between these two models depends entirely upon the size of the trees and acreage which is to be treated.

DUSTING COTTON

The control of Cotton Boll Weevil by means of dusting the plants with Calcium Arsenate has assumed such tremendous importance that an entirely new type of duster driven by traction power has been designed to make the applications of dust in the cotton fields of the South. This machine is known as the Niagara Traction Cotton Duster. Hundreds of these machines are already in operation and the dusting treatments have resulted in tremendous financial gain wherever attempted. A full description of the machines and materials which are used for cotton dusting purposes is furnished in a special circular which will be sent upon request.

Niagara Sprayer Co.
Gentlemen:—

I have used Powdered Calcium Arsenate on potatoes to kill bugs with great success. The material was dusted on with a Niagara Hand Duster and in twenty-four hours the bugs had disappeared. The foliage of the potatoes was not injured in any way by the arsenate.

(Signed) LOUIS A. GOULD.

Niagara Sprayer Co.,
Middleport, N. Y.

Williamson, N. Y.,
November 5, 1919.

Gentlemen:—

On account of the great interest which we have noted in the orchard dusting method, we have kept an accurate record of our operations this year on our thirteen acre orchard.

This orchard contains 355 fifteen year old McIntosh, 120 fifteen year old Wealthy, and 210 Twenty-oz., budded on Spies, and not yet large enough to bear a crop.

The following is our record of the work:—

May	24	3	sacks	90-10
"	30	3	"	" "
June	2	3	"	" "
"	9	3	"	" "
"	11	4 1-2	"	" "
"	18	3 1-2	"	" "
"	26	3	"	" "
July	3	3	"	" "
"	10	3	"	" "
"	15	3	"	" "
Aug.	1	3	"	" "
"	16	4	"	dusting sulphur

The only liquid spraying done was a delayed dormant application of your soluble sulphur compound.

The McIntosh bore heavily last year, and we consequently had a light crop this season. The following is a record of our returns:—

A GRADE
190 bbls. Wealthy
410 " McIntosh
22 " 20-Ounce

B GRADE
9 bbls. Wealthy

C GRADE
16 bbls. Wealthy
107 " McIntosh
7 " 20-Ounce

Total 761 bbls.
20 bushels Culls

You may wonder at the number of applications we made; but on account of the unusual weather conditions, we decided to take no chances, preferring to waste dust rather than the quality of the fruit, as a small difference in quality pays for a lot of dust. Had this been the bearing year, the cost per barrel for dust would, of course, have been less. Last year, under more normal weather conditions, we dusted much less, had a full crop, and more than 90% was A Grade fruit.

I am perfectly satisfied with the dusting machine and materials bought of you and shall continue this method of orchard treatment.

Yours respectfully,

H. V. PEARSALL.

CONCLUSION

Practically every State Experiment Station in the United States today is conducting experiments in one way or another with dusting. The U. S. Department of Agriculture are carrying on at least twenty different demonstrations in as many states and there are upwards of two thousand dusting machines in actual commercial operation. Success attained in the technical experiments as well as in the commercial field work clearly demonstrate that the dusting method is the greatest development in the protection of trees and plants against insects and diseases which has occurred in the past decade.

If the same intelligence and care and study is devoted to the advancement of the dusting method as has been the case with liquid spraying, there can be no question but what the peculiar advantageous features of the dusting method will make it possible to obtain even better results in the future than have been obtained in the past, and even were the results obtained no better than have been heretofore obtained from liquid spraying, the advantages of the **method** of the applications are such, under our present conditions of labor that the time is now at hand when the modern orchardist and the modern planter of practically all crops must consider the dusting method of treatment against insects and diseases as indispensable if he is to produce high quality produce at a minimum cost of money and labor.

Niagara Sprayer Co.
Gentlemen:—

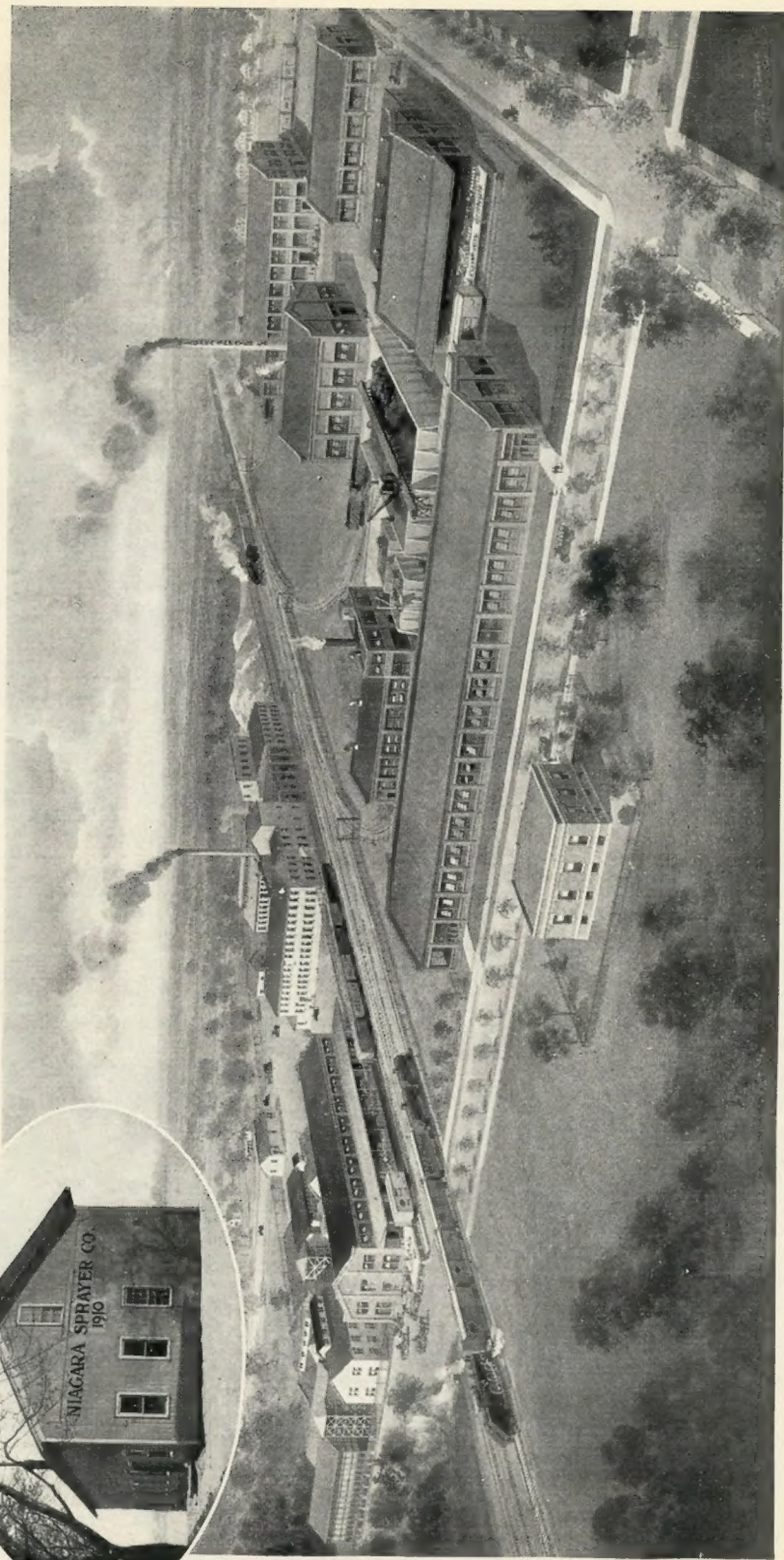
December 23, 1919.

We packed about fifteen crops at our Adams County Fruit Packing & Distributing Co., central packing house and our records show there was no difference between orchards sprayed and orchards dusted. The orchard showing the smallest percentage of defects belonged to Mr. E. P. Garrettson, Biglerville, Adams County, Pa., and he did not do anything but dust. We understand that he dusted his orchard about five or six times. Our own crops were treated with dust exclusively and we packed 80% clean fruit.

The principal trouble in the East was scab and that caused by cedar rust, and orchards that were sprayed as often as six times showed very little control, and outside of the dormant treatment we think everybody who used dust last year will use it again this year.

I positively think that the dusting machine and dusting materials are one of the greatest assets that a large fruit grower can possess, as there is considerable virtue in this material for the control of chewing insects and fungus disease, and taking into consideration the time that it takes to spray as compared with the time it takes to dust, with bad weather conditions existing, a large grower cannot treat his orchard often enough with the liquid solution.

Yours truly,
D. N. Minck & Bro.



Plant of Niagara Sprayer Co., Middleport, N. Y.



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W. C. RUDMAN
Irondequoit, N. Y.